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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/644,791  
Filing Date: August 19, 2003  
Appellants: GALLO ET AL.

**MAILED**  
JUL 24 2006  
**GROUP 1700**

Julie W. Meder  
For Appellants

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed June 7, 2006 appealing from the Office action mailed January 5, 2006.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

6,432,540	GALLO	8-2002
11-269347	Japan (FUJII et al.)	10-1999
10-212396	Japan (SAITO et al.)	8-1998
11-100492	Japan (YAMAGUCHI et al.)	4-1999

**(9) Grounds of Rejection**

The following grounds of rejection are applicable to the appealed claims.

The text of section 103(a) of Title 35, U.S. Code not included in this action can be found in the non-Final rejection mailed September 20, 2005 (page 4).

Claims 1-15 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gallo Patent No. 6,432,540 and Japanese Patent Nos. 11-269347 (Japanese '347) and 10-212396 (Japanese '396) in view of Japanese Patent No. 11-100492 (Japanese '492).

Gallo (col. 6, Table 1, Sample 23A) shows a molding composition "substantially free of halogen, phosphorus and antimony (col. 1, lines 60-65)" comprising 5.34% by weight of a biphenyl epoxy resin, 1.00% by weight of an epoxy cresol novolac epoxy resin, 0.75% by weight of tungsten trioxide (i.e.  $WO_3$ ), 2.47% by weight of phenol novolac hardener, 83.19% by weight of silica filler, and 5.1% by weight of catalysts, wax mold release agents, silane coupling agents, elastomers and an ion scavenger.

Japanese '396 (CAPLUS abstract example, AB, lines 4-7 and translation, page 4, Table 1, Example 1) shows a molding material prepared from 4.6% by weight of a biphenyl epoxy resin, 0.46% by weight of molybdenum trioxide, 4.1% by weight of an aralkyl phenolic resin (i.e. Milex XL 225), 89.9% by weight of fused silica filler, and 0.81% by weight of additives including a polyethylene wax mold release agent, a carbon black pigment and an alkylsilane coupling agent.

Tungsten trioxide can be utilized instead of or in admixture with the molybdenum trioxide (abstracts and page 2, paragraph 6). A phenol novolac epoxy resin can be used as the epoxy resin (page 2, paragraph 8, line 4). The inorganic filler can be employed in amounts of as low as 85% by weight (Patent Abstracts of Japan and page 3, paragraph 13).

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A flame retardant assistant such as a melamine isocyanurate can be included which is synonymous with the claimed melamine cyanurate (page 3, paragraph 14 and Chemical abstracts registry no. 37640-57-6 wherein the depicted structure is identical to that for melamine cyanurate illustrated in Japanese '492 on page 9, Chemical Formula 4).

Japanese '347 (CAPLUS abstract example, AB, lines 4-8 and translation, page 5, Table 1, Example 1) shows a molding formulation obtained from 5.4% by weight of a biphenyl epoxy resin, 0.27% by weight of molybdenum oxide, 4.9% by weight of aralkyl phenol resin, 85.8% by weight of fused silica microspheres, and 0.88% by weight of additives such as a polyethylene wax mold release agent, a carbon black pigment and an epoxysilane coupling agent.

Although the examples of Japanese '396 and '347 contain triphenylphosphine and tri-p-toylphosphine-o-benzoquinone, respectively, as hardening accelerators, the claimed composition embraces the use of substituted phosphine catalysts such as triphenylphosphine (page 8, paragraph 28) which does not violate the claimed "substantially free of phosphorus" language as exhibited in Table 1A on page 10 and Table 2A on page 13 of the instant specification.

The claimed melamine cyanurate is not exemplified, although Japanese '396 expresses its suitability as a fire-resistant assistant for the molybdenum trioxide and/or tungsten trioxide (page 3, paragraph 14).

Japanese '492 (based on the translation submitted with the appeal brief) teaches a molding composition comprising 6.7% by weight of a cresol novolac epoxy resin (page 14, Table 1, Example 8 or 7.4% by weight of biphenyl epoxy resin (Example 6), 3.6% by weight of phenol novolac resin (Example 8), 84.1% by weight of silica, 0.32% by weight of additives such as curing promoters, wax mold release agents and carbon black pigment, and from 1 to 20% by weight of a fire retardant (page 9, paragraph 23) wherein from 95-100% by weight constitutes an organic fire retardant such as melamine cyanurate (page 7, paragraph 16, lines 5-6 and pages 8-9, Chemical Formula 4) and from 0 to 5% by weight is composed of an inorganic fire retardant such as a metal oxide (page 9, paragraph 22). The calculated amount of melamine cyanurate within the overall proportion of fire retardant ranges from 0.95-20% by weight. The calculated level of metal oxide is from 0 to 1% by weight.

It would have been obvious to combine the molybdenum trioxide and/or tungsten trioxide of Gallo, Japanese '396 and '347 with a fire-resistant assistant such as the melamine cyanurate of Japanese '396 and '492 in order to further boost the fire resistance (Japanese '396) and to increase the soldering heat resistance and high temperature reliability while enhancing the flowability over the use of a metal hydroxide and metal oxide alone (Japanese '492, pages 4 and 5, paragraphs 3 and 4).

Claims 1-15 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese '492 in view of Gallo and Japanese '347.

The references are described in detail hereinabove. Japanese '492 sets forth metal oxides without specifying the claimed Group IVA metal oxide such as tungsten trioxide.

Gallo (col. 1, lines 12-46) teaches the use of a Group VIA metal oxide (col. 1, lines 60-65) such as tungsten trioxide (col. 6, Table 1, Sample 23A) as a flame retardant for a molding composition comprising an epoxy resin and phenol novolac hardener exhibiting a good full cure within a short time, low moisture absorption and toxicity, and good electrical reliability at a high temperature. Japanese '347 (Derwent abstract, Advantages section) attributes high reliability and good moldability without affecting the environment to the use of molybdenum oxide or tungsten oxide in formulations containing an epoxy resin and an aralkyl phenol resin.

It would have been obvious to employ the Group VIA metal oxide of Gallo such as the tungsten trioxide of Gallo and Japanese '347 as the metal oxide of Japanese '492 in order to provide a good full cure within a short time, low moisture absorption and toxicity, good electrical reliability at a high temperature and good moldability.

**(10) Response to Arguments**

**Re Gallo and Japanese '347 and '396 v. Japanese '492**

Japanese '492 on page 4, paragraph 3, discloses that the use of both metal hydroxide and metal oxide as the fire retardant improves the safety, soldering heat resistance and high temperature reliability of the resin-encapsulated semiconductor device. Paragraph 4 on pages 4-5 espouses that even better soldering heat resistance and high temperature reliability have been desired, and that the utilization of both metal hydroxide and metal oxide "is not sufficiently reliable for some semiconductor elements." Furthermore, the flowability of the encapsulant during molding decreases to the extent that molding becomes impossible. The objective for Japanese '492 was "if an organic fire retardant is used as the main component of the fire retardant agent, not only can solder heat resistance and high temperature reliability [can] readily be obtained, but also the good forming ability can be obtained . . ."

An unequivocal basis exists for the motivation of combining a metal oxide fire retardant such as the molybdenum trioxide and/or tungsten trioxide of Gallo, Japanese '347 and Japanese '396 with the melamine cyanurate of Japanese '492 in order to improve the solder heat resistance and high temperature reliability without compromising the flowability during molding. Moreover, Japanese '396 confirms the use of melamine cyanurate together with molybdenum or tungsten trioxide (page 3, paragraph 14).



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Accordingly, based on the express teachings of Japanese '492 and '396, it would have been obvious to combine the molybdenum trioxide and/or tungsten trioxide of Gallo, Japanese '347 and Japanese '396 with the melamine cyanurate of Japanese '396 and Japanese '492 in order to enhance the solder heat resistance and high temperature reliability while maintaining flowability during molding.

Japanese '492 on page 9, paragraph 22 states that "inorganic fire retardant agents such as metal oxides, metal hydroxides, etc., can be used at 0-5 wt% of the fire retarding agent." The description is not confined to any type of metal oxide such as the exemplified nickel oxide, but embraces metal oxides in general which encompass the molybdenum trioxide and/or tungsten trioxide of Gallo, Japanese '347 and Japanese '396. Thus, the duo of melamine cyanurate and metal oxide wherein the metal is not limited is clearly within the confines of Japanese '492.

The motivation for mixing the metal oxide with an organic fire retardant such as melamine cyanurate expressed in paragraphs 3 and 4 on pages 4-5 of Japanese '492 is not contingent upon the proportions of the individual fire retardants. The paragraphs recognize that the pairing of a metal oxide with melamine cyanurate yields better soldering heat resistance and high temperature reliability without sacrificing flowability during molding regardless of the relative amounts of the individual fire retardants.

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Paragraph 23 on page 9 merely establishes the criticality of the upper limit of 20% by weight of fire retardant which does not compromise the teaching that blends of metal oxide and melamine cyanurate provide the aforementioned benefits within the range of from about 1-20% by weight wherein 0.95 to 20% by weight constitutes melamine cyanurate and as much as 1% by weight comprises the metal oxide.

According to MPEP § 2144.06 under the heading "Art Recognized Equivalence for the Same Purpose: Combining Equivalents Known for the Same Purpose,"

"It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose . . . [T]he idea of combining them flows logically from their having been individually taught in the prior art."  
(*In re Kerkhoven*, 205 USPQ 1069, 1072, CCPA 1980 and *In re Crockett*, 126 USPQ 186, CCPA 1960).

The prior art establishes that both melamine cyanurate as well as molybdenum trioxide and/or tungsten trioxide function as flame retardants in epoxy resin molding compositions. It would have been obvious to combine the molybdenum trioxide and/or tungsten trioxide of Gallo, Japanese '347 and Japanese '396 with the melamine cyanurate of Japanese '492, each of which is taught to be useful as flame retardants in order to form a third composition comprising a blend thereof for the very same purpose as flame retardants.

A comparison between Examples 6 and 7 vs. Examples 8 and 9 from Tables 1 and 3 on pages 14 and 16, respectively, of Japanese '492 has been relied upon to support the allegation that no difference properties is noticeable between Examples 8 and 9 including melamine cyanurate alone vs. Examples 6 and 7 containing melamine cyanurate and nickel oxide except for the contended better flow viscosity for the examples with the melamine cyanurate alone.

Any differences in results between Example 6 vs. Examples 8 and 9 cannot be singularly attributed to the species of fire retardants since Example 6 employs different types and amounts of epoxy resin and phenolic resin as well as significantly diverse amounts of silica which is a viscosity modifier having a direct effect on the measured flow viscosity. The closest valid comparison wherein the types and amounts of epoxy resin and phenolic resin are held constant along with the concentration of silica and fire retardant is between Example 7 containing melamine cyanurate and nickel oxide, and Example 8 with melamine cyanurate alone. Table 3 reports a flow viscosity of 250 poise for Example 7 vs. 150 poise for Example 8 along with the same solder heat resistance and high temperature reliability.

Therefore, Example 7 with a blend of metal oxide and melamine cyanurate demonstrates significantly higher flow viscosity while maintaining suitable solder heat resistance and high temperature reliability over Example 8 containing solely melamine cyanurate, thereby corroborating paragraphs 3 and 4 on pages 4-5 of Japanese '492.

The declaration filed October 21, 2004 on page 3, Table 1 compares Sample A with 6.00% by weight of tungsten trioxide and 4.00% by weight of melamine cyanurate, Sample B with 6.00% by weight of tungsten trioxide and Sample C with 4.00% by weight of melamine cyanurate. The contents of melamine cyanurate and tungsten trioxide lie outside of the claimed ranges of from about 0.1 to about 3.5 percent by weight, and from about 0.1 to about 2 percent by weight, respectively, defined in claims 8, 12 and 27. Therefore, the criticality of the claimed proportion ranges has not been confirmed.

The evidence is not commensurate in scope with the claims regarding a representative sampling of the species of metal oxide within the Group VIA metals including chromium oxide and molybdenum oxide along with compounds thereof and tungsten oxides having various oxygen contents. The closest prior art Example 7 of Japanese '492 containing a blend of melamine cyanurate and nickel oxide is not represented by either Samples B and C.

**Re Japanese '492 v. Gallo and Japanese '347**

The motivation for using the Group VIA metal oxide of Gallo such as the tungsten trioxide of Gallo and Japanese '347 as the metal oxide of Japanese '492 firmly resides in the express teachings of Gallo and Japanese '347. Gallo clearly recognizes improved properties such as a good full cure within a short time, low moisture absorption and toxicity, and good electrical reliability accruing from the utilization of a Group VIA metal oxide such as tungsten trioxide as a flame retardant in column 1, lines 12-46. Japanese '347 acknowledges high reliability and good moldability emanating from the presence of molybdenum or tungsten oxide as a fire retardant (Derwent abstract, Advantages section). Accordingly, it would have been obvious to employ the Group VIA metal oxide of Gallo such as the tungsten trioxide of Gallo and Japanese '347 as the metal oxide of Japanese '492 in order to take advantage of the aforementioned benevolent features.

The recognition is Gallo that a Group VIA metal oxide imparts lower moisture absorption than a phosphorus-containing compound does not mitigate its inherent ability to provide moisture resistance just because the basis for its improvement is a phosphorus-containing compound precluded by the claims. One skilled in the art would be motivated to employ a Group VIA metal oxide such as tungsten trioxide based on its inherent moisture resistance regardless of the standard whereupon its improvement is predicated.

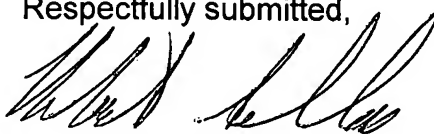
Japanese '492 is not restricted to the exemplified nickel oxide as the metal oxide fire retardant. The use of metal oxides in general as fire retardants is elucidated on page 9, paragraph 22. It would have been obvious to employ a particular metal oxide fire retardant such as the tungsten trioxide of Gallo and Japanese '347 with the melamine cyanurate of Japanese '492 in order to provide a good full cure within a short time, low moisture absorption and toxicity, good electrical reliability at a high temperature and good moldability.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,



Robert Sellers

Conferees:



Randy Gulakowski



James Seidleck